



THE UNIVERSITY *of* EDINBURGH

Edinburgh Research Explorer

The Experience of Carbon Rationing Action Groups

Citation for published version:

Howell, R 2009, *The Experience of Carbon Rationing Action Groups: Implications for a Personal Carbon Allowances Policy*. Oxford University Environmental Change Institute, Oxford.

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Publisher's PDF, also known as Version of record

General rights

Copyright for the publications made accessible via the Edinburgh Research Explorer is retained by the author(s) and / or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

The University of Edinburgh has made every reasonable effort to ensure that Edinburgh Research Explorer content complies with UK legislation. If you believe that the public display of this file breaches copyright please contact openaccess@ed.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.





UK Energy Research Centre
Demand Reduction Theme, University of Oxford

The Experience of Carbon Rationing Action Groups: Implications for a Personal Carbon Allowances Policy

Final Report

Rachel Howell

UK Energy Research Centre – Demand Reduction Theme
Environmental Change Institute
Oxford University Centre for the Environment
South Parks Road
Oxford OX1 3QY

www.eci.ox.ac.uk
www.ukerc.ac.uk

1 Introduction

Individuals are responsible, through their use of energy in the home and for personal transport, for 51% of total UK carbon dioxide (CO₂) emissions, including carbon equivalent emissions from aircraft (Fawcett 2004). Clearly, if the government's target of an 80% cut in CO₂ emissions by 2050 is to be met, significant reductions must be made in individuals' direct emissions. A policy of Personal Carbon Allowances (PCAs) has been proposed to facilitate this.

A PCAs scheme would have the following key features:

- A national annual limit on CO₂ emissions from energy use would be set;
- Every eligible citizen would receive a free, equal share of permitted emissions – their personal carbon allowance;
- The allowance would cover all direct energy use by individuals – home energy and personal transport use;
- The allowances would be tradable;
- The allowances would decrease over time, in order to meet stated emissions reduction targets.

Two main variants of a Personal Carbon Allowances scheme have been proposed: Domestic Tradable Quotas (DTQs), first proposed by Fleming (1996, 2005), who now refers to them as Tradable Energy Quotas (Fleming 2007), and an alternative referred to as personal carbon rationing (Hillman 1998, Fawcett 2004, Hillman and Fawcett 2004). Bottrill (2006a) provides a summary of the proposals, and the variations between them.

Proponents of PCAs claim that such a scheme would raise awareness and change behaviour more than carbon taxes or upstream measures would, but there is little evidence to substantiate this at present. There is considerable concern among policy makers that such a scheme would not be acceptable to the general public. There are also important issues to consider such as whether individuals will be able to understand their allowance and budget for their emissions, whether they will be able to reduce their emissions significantly if they wish to, and whether they will be willing and able to trade in carbon units.

Work on the potential for trialling PCAs (Fawcett *et al* 2007) concluded that a trial that could meaningfully attempt to explore any of these questions could cost between £500,000 and £950,000 and take between 2.5 and 3 years.

However, there exists in the UK a movement of grassroots Carbon Rationing Action Groups (CRAGs) that, in theory at least, operate (on a voluntary basis) the nearest scheme in existence to PCAs. This research project was therefore commissioned in order to learn about the operation of CRAGs and the experiences and insights of individuals involved, in the

hope that this might prove a step forward in understanding the psychological and practical implications of PCAs for individuals.

2 Overview of Carbon Rationing Action Groups

2.1 History¹

Andy Ross first articulated the idea of forming local carbon rationing groups after the Climate Change March in London in December 2005, inspired by George Monbiot's speech calling for 90% emissions cuts by 2030 (see Monbiot 2006), and influenced by Hillman and Fawcett's (2004) proposal for carbon rationing. He published his draft proposal on the Campaign against Climate Change website later that month (Ross 2005). As a result of this and conversations with and between other activists, CRAGs were formed in Oxford, Leamington and Hereford in the first half of 2006 by Ross and other concerned citizens. A discussion of CRAGs during the Climate Conference at the London School of Economics in June 2006, a CRAG workshop at the Climate Camp in August and the launch of the CRAG website (www.carbonrationing.org.uk) in September of that year all contributed to disseminating the concept further. The movement has been steadily growing since then and there are now 24 groups listed on the website as 'active' in the UK² (see section 2.3, below).

2.2 Aims and principles of the movement

In July 2006 Andy Ross wrote *Carbon Rationing Action Groups: A Short Guide* (Ross 2006), setting out the background to the scheme and details of how CRAGs would operate. The stated aims were:

1. To make us all aware of our personal CO₂ footprint
2. To find out if it can help us make radical cuts in our personal CO₂ emissions
3. To help us argue for (or against!) the adoption of similar schemes at a national (DTQ) and/or international (C&C) [Contraction and Convergence] level
4. To build up solidarity between a growing community of carbon conscious people
5. To share practical lower-carbon-living knowledge and experience.

The *Guide* envisaged that each CRAG would agree a fixed, equal-per-capita ration for members' CO₂ emissions for the 'carbon year', and would have a 'carbon accountant' to whom members would regularly send details of energy usage in order for their emissions to be calculated using agreed conversion factors. It was suggested that only home energy use, car travel and flights should be accounted for, for the sake of simplicity. Proof of the figures, in the form of copies of bills, MOT certificates and plane tickets would be required at the end of the year. Household

¹ See <http://www.carbonrationing.org.uk/wiki/how-did-crags-get-started?> and <http://www.carbonrationing.org.uk/wiki/crags-chronology?> for full details of the movement's history

² Last checked 20/10/2008

emissions would be divided by the number of members of the household, whatever their age (in other words, children would get a full carbon ration), but car emissions would be deducted solely from the car owner's ration, again in order to keep the scheme simple. Each CRAG was advised to agree on its own price per kilogram for CO₂ emitted over the ration for the year, to be paid by over-emitters into a 'carbon fund', and to determine how the funds would be distributed. Carbon trading was not assumed: suggestions for use of the carbon fund included giving it to under-emitters in proportion to their share of the total savings, to a charity or an environmental project, or a combination of any or all of these possibilities.

In practice, different CRAGs have developed different ways of doing things. Some do not have a fixed ration and many do not have a financial penalty for over-emitters. CRAGs do not necessarily have a carbon accountant or require proof of a member's energy usage, and there is wide variation in the conversion factors used, particularly for 'green electricity' tariffs, and in whether and what travel by public transport is included (see Sections 5.3, 5.4 and 5.5, below). In general, one could say that many CRAGs are groups formed to encourage members to reduce their carbon footprints, rather than to engage in carbon *rationing* as such, and some groups have chosen to call themselves Carbon *Reduction* Action Groups.

2.3 Current CRAGs

There are currently (October 2008) 24 'active' UK CRAGs listed on the website. It is somewhat questionable whether all 24 really are active; members of two of these CRAGs expressed doubt when interviewed about whether their CRAG was still functioning. A further 10 are included in the 'start-up' list for groups that are forming but have either not set their rules or not yet started their first carbon year. One of the active CRAGs, WSP Personal Allowance Carbon Tracking (WSP PACT), is run by the WSP Environment & Energy consultancy business for its employees around the UK; the others are all local community groups formed by concerned citizens. Typically the groups have 8-12 members, although one has only three active members and WSP PACT has as many as 54. Approximately 250-350 people are involved in a CRAG, and many more individuals have registered themselves on the website although they are not members of a particular CRAG.

Appendix 1 gives details of all the active CRAGs in the UK.

Recently there has been interest in CRAGs in other countries, and the CRAG website now (as at October 2008) lists four active CRAGs and one starting up in the USA, and one active CRAG and three starting up in Canada.

3 Research aims

The overall objective of this research was to determine whether the operation of the CRAGs movement, and the experiences of individuals involved, can offer any useful information about the process of individual/household level carbon footprint reductions, the psychological effects of having a carbon allowance and trading system, and therefore any issues for consideration in the design of a Personal Carbon Trading policy. The specific aims were therefore:

- to obtain factual information about CRAGs, such as details of the carbon allowances set, accounting procedures and trading systems;
- to learn about the experiences of individuals involved, such as whether they have made behavioural changes and cut their CO₂ emissions, and if so how, what they have found easy or difficult in their attempts to live a lower-carbon lifestyle;
- to elicit the opinions of CRAG members on their motivations for involvement in the movement, on personal carbon trading, and on the benefits and limitations of CRAGs;
- to attempt to discover what role, if any, being part of a group plays in demand reduction, given that the behavioural changes themselves are at the individual/household level.

4 Research methodology

In order to obtain the opinions and experiences of CRAGgers, semi-structured interviews were carried out between June and August 2008 with 23 members of the movement, from 10 different CRAGs. Five were telephone interviews; the rest were conducted face-to-face in the interviewees' homes. Two couples were interviewed together and the other interviews were one-to-one. The interviews lasted between 20 minutes and an hour, depending on the interviewee's interest and, to a certain extent, the amount of factual information about the CRAG that I had already received.

The interviewees were recruited through emails targeted to particular CRAGs, using contacts gained from the CRAG website. The invitation stated that the aim of the research was 'to learn more about the motivations and experiences of people who are involved in CRAGs' and that it would feed into a bigger project on 'demand reduction and lower carbon futures', but not specifically that it was linked to research on PCAs, in order to try and avoid biasing the sample towards those who have strong opinions on PCAs or the trading aspect of CRAGs. Participants were offered £20 for their time.

Particular CRAGs were targeted in order to ensure that a good range of variants was represented: longer established groups and newer ones, rural and urban CRAGs, those that have a penalty and those that don't, those that operate a form of trading and those that have chosen not to give the financial penalties to under-emitters, and CRAGs which have fixed

targets, percentage reduction targets and individually chosen targets. WSP PACT, a workplace-based CRAG, was also included, as well as a CRAG that petered out during its first year, in order to discover why it hadn't worked (see Table 1).

Table 1: Features of particular interest in the CRAGs included in this study

CRAG	Inter-viewees	Details of interest
Oxford	3	2 years completed. Financial penalty but no trading.
Hereford	3	Into third year. Rural. No penalty.
Hackney and Islington	2	Into second year. Operates rudimentary carbon trading.
Glasgow	3	Into second year. Operates rudimentary carbon trading.
Leeds	2	Just completed one year. Own targets and penalties; no trading. Calls itself a Carbon <i>Reduction</i> Action Group.
York	2	Just completed one year. No penalty. Calls itself a Carbon <i>Reduction</i> Action Group.
WSP PACT	3	Part way through first year. Workplace-based CRAG. Penalty and reward.
Fownhope	3	Part way through first year. Rural CRAG. Percentage reduction rather than fixed target. No penalty.
Peckham	1	New CRAG still getting going. No penalty.
Edinburgh	1	A 'failed' CRAG.

A short questionnaire was sent to some participants to be completed before the interview, to elicit or confirm factual details about their CRAG such as the number of adult members and the target and financial penalty.

The interviews were digitally recorded and transcribed in full, then analysed and coded.

5 Findings

In what follows I have quoted frequently from the interview transcripts in order to provide something of the flavour of CRAGgers' opinions as well as the content. Participants are identified by number, P1 to P23. Due to the small sample size great caution must be exercised in making any generalisations. I have in some cases given an indication of what proportion of interviewees subscribed to a particular view or action, but it must be borne in mind that the interviewees were not necessarily representative of the CRAGs they belonged to, nor of the movement as a whole – for example, the sample may have been biased by self-selection of those who are most active or hold the strongest views. Similarly,

although particular CRAGs were targeted when recruiting interviewees in order to provide data from as wide a range of different CRAGs as possible, those chosen are not necessarily representative of the whole movement.

5.1 Who is involved in CRAGs?

In general, the CRAGgers interviewed could be informally described (and some did describe themselves) as 'the usual green suspects'. Questions about involvement with other voluntary groups, whether interviewees address concerns other than climate change through their lifestyle choices, and factors influencing purchasing decisions revealed that they largely fit the 'egalitarian' type in cultural theory (Dake and Thompson, 1999; Michaelis 2007). Egalitarians are politically engaged and, as consumers, distinguish 'real' from 'false' needs and often make consumption choices based on ethical (including social and environmental) concerns rather than tradition, fashion or price. Many interviewees stated that they try to buy fair trade products, and some mentioned principles of buying organic goods, second-hand goods, avoiding clothing produced in sweatshops, boycotting certain products or companies for ethical reasons, eating a vegetarian diet, and reducing or limiting their consumption. Typically they were involved in, and/or contributed financially to other environmental, world development, community or charitable groups as well as the CRAG. Some saw a social justice aspect to the CRAG movement:

...the whole transition stuff [the Transition Town movement] I like but what I think transition misses out on is the social justice aspect and that is what I suppose I liked about the CRAG stuff is that it has that. (P17)

And also some of us have got these development interests as well so we were quite interested in the idea of the [financial penalties] going to poorer communities. (P2)

The interviewees from WSP PACT (the workplace-based group) were something of an exception to this stereotype. While having some environmental concerns, they did not mention current spare-time involvement in these kind of NGOs, or specify consumption/lifestyle choices in response to ethical concerns apart from climate change, other than recycling/reducing waste, and in one case encouraging wildlife in the garden. In general, the changes they had made to reduce their carbon footprints were less radical than those made by many other interviewees. In other words, they were somewhat less atypical of the general public than most of the CRAGgers interviewed. The WSP PACT scheme is also less ambitious than the average CRAG: the target is higher than that for almost all other groups, the conversion factor for flights is significantly lower, and 'green electricity' tariffs are counted as zero carbon, which is rare among CRAGs. As such, and given the way it operates as an employer-managed scheme with minimal time commitment on the part of ordinary members, it perhaps offers a model for other schemes that could be more easily adopted than the more demanding typical CRAG.

Having said that, not all non-WSP CRAGgers were necessarily at the far end of the 'usual green suspect' line. One stated:

Whereas I have heard of Friends of the Earth, I've heard of Greenpeace, I've heard of some of the other more local groups and [...] they have this image, this perception of being a bit hair shirt, lentil munching tree huggers sort of thing and I don't want to get into that. I mean, I drive a car, I'm an omnivore... (P19)

while another took an arguably more standard view of the limits of personal responsibility than most CRAGgers, expressing unwillingness to make too many sacrifices when others don't:

In one way this has had a disastrous effect in that my wife has now decided she won't fly at all [...] While I agree with it all I don't see the point of completely altering your life when she's got nine grandchildren with carbon footprints four or five times hers, having no effect on her children and grandchildren's lives. I say to her, "For us to do the odd flight is really neither here nor there in this thing. By doing that you're not having any impact on the group closest to you"... (P11)

This kind of comment was uncommon among CRAGgers, who generally seemed willing to adopt a 'first mover' approach, judging their efforts worthwhile, necessary and even a moral imperative, no matter what other actors – including government and industry as well as individuals – were doing (or not doing).

One general phenomenon that emerged from the interviews was that comments were often couched in overtly 'moral' language, interviewees describing themselves or others as 'good' or 'bad' in terms of their behaviour and carbon footprints, rather than using merely factual statements such as 'we mostly reached the target' or 'she had a large footprint'.

5.2 Motivations for involvement

Interviewees gave a range of reasons why they had started or joined a CRAG. Most gave more than one reason. Not surprisingly, over half of them stated that they wanted to cut their own carbon footprint. Six interviewees specifically mentioned a sense of personal responsibility for dealing with the threat of climate change:

...we have to do a lot of the work ourselves; it is not up to the government... (P3)

...it was just a sense of responsibility, it just seems to me wrong to make the world a difficult place for poor people now and for future generations, whether I have children or not, it's just wrong. (P4)

Another very common reason, cited by over half the interviewees, was a desire to act as an example in some way, either to show other members of the general public what is possible:

...there's also the aspect of trying to actually show people what *can* be done, and that's fairly meaningless on your own... (P4)

...quite a large part of what I thought a CRAG ought to be doing was demonstrating through press releases and showing people that it's possible to make these changes and it is possible to help one another to find ways to have an equally reasonable quality of life without using too much carbon. (P15)

...I saw CRAG [...] as a way [...] to reach out to people who might be thinking 'well I keep on reading this in the papers and hearing it on the news, what do I do?' And I saw it as a vehicle for conveying information. (P18);

to be seen to be practicing what they advocate:

...I also feel like if I am working on [PCAs] there is a little bit I have got to walk the talk. (P1)

I work for an environmentally-based company and the whole issue of climate change based on the assumption of human emissions and stuff, to be seen to be doing something about it [...] it seems a positive step really... (P22)

or to encourage the government to take further action:

I saw it initially as a group that was aimed at addressing one's own personal carbon footprint and I thought 'well we're doing what we can anyway' but [our son and daughter-in-law] were arguing quite strongly to us that joining a group made it clear that one was part of that and made some sort of political impact... (P8)

...a thing I've come to realise increasingly about being in a group and being part of a wider network is that [...] it's becoming obvious to other institutions, particularly government, that there *are* people out there who are *not* burying their heads in the sand, who are *not* afraid of the implications, who want government and industry to squarely face the issues instead of constantly dodging. (P9)

Some CRAGgers (only one of whom had a professional academic interest in the issue) explained that they wanted to explore personal carbon trading through involvement in a CRAG. For one interviewee, this was her sole motivation for joining:

I had heard about personal carbon trading and I was a little bit dubious about it, thinking 'well that actually, is that quite onerous, is that a good thing?' I was sitting on the fence, I didn't really know and I wanted to try it out for myself and to see how it worked. So that's why I joined. (P16)

A few others went one step further, wishing to demonstrate, rather than simply explore, the concept of PCAs as part of advocating their introduction in the UK.

Other motivations for involvement in a CRAG mentioned by a few interviewees included a desire to develop carbon literacy and to meet like-minded people. Only one person mentioned the potential financial reward to be gained from beating the target as a factor in his decision to join.

A couple of interviewees said that they had originally been unsure about whether they wanted to get involved in a CRAG. One had ended up in a CRAG almost by accident through attending an event at which he wanted to join a different action group, which had been too full. The other had been invited to join by a friend.

There are other environmental groups that focus on behavioural change, such as Global Action Plan's EcoTeams, which focus on reducing household waste production, water consumption, transport and energy use, but do not quantify carbon emission reductions. The appeal of CRAGs seems to be that particular focus:

where I was living about five or six years ago they were trying to set up EcoTeams and that didn't really particularly appeal. I think to be honest because I felt that a lot of what they were trying to get EcoTeams to do I was already doing. I just thought, well, what do I have to contribute? It seemed to be getting people to recycle glass bottles and stuff. So when I found out about CRAGs [...] I think what really appealed was that it's really trying very hard to be focussed about getting your greenhouse gas emissions down, so it wasn't some sort of vague thing about recycling a bit of glass or whatever, it was something very focussed and I felt, well that was already what I was trying to do. (P14)

5.3 Rations/Targets

Most CRAGs have chosen a 'carbon ration' or target that is the same for each member of the group, following the principle of equal per capita allowances proposed by proponents of PCAs. However, a few have decided to operate differently. Sevenoaks CRAG targets a differentiated annual percentage reduction from each individual's baseline (the emissions for the year immediately preceding the current one), ranging from 25% reduction per year for those who start with a footprint of 15-20 tonnes, down to 5% reduction for those who start with a footprint of 5 tonnes or lower. The Sheffield area CRAG has individual targets, converging by 2030 and therefore also requiring higher emitters to make larger reductions. In Fownhope all members are targeting a 10% reduction on their baseline footprint, no matter what that is. Two CRAGs have personal targets based on percentage reductions from the individual baseline footprints combined with a group average target; only those who emit over this average target will be liable to pay the financial penalty if the group target is not met. Leeds CRAG allow members to choose their own target, the only stipulation being that it must be lower than the previous year's footprint (though it doesn't have to be below the previous year's target, if that was not met).

The rationale for variable targets is to encourage low emitters to continue trying to reduce their emissions, while not being too off-putting to high emitters:

...really it was about wanting people to be able to join whatever level they were at, and we started off with people who were on ten tonnes and there was one woman at the start who [...] was only on one, she claimed, so it seems almost meaningless to have a group target. (P4)

Unless there is very little variation between individual members' footprints in a CRAG, a fixed target means that some members will not have to make any effort to meet the target, whereas others may feel that it is unachievable before they even start. One CRAG found that they lost a member with a large footprint because of their decision to have a fixed target, a decision that was preceded by "heated debate":

She wasn't able to make those changes to her life which would have been necessary to avoid coming in as the highest person each time and she thought it would be a demoralising experience for her. She wanted to be supported in just trying to make *some* cuts. I was really torn about it because if you look at it from a common sense point of view you think well, if people are just making some cuts then it's good. (P23)

However, the majority of the group felt that a fixed, per capita target was fair:

...it really came down to a moral argument I think [...] we just have to go ahead and do it and set what we think is equitable rations for everyone which are equal. Because, just because we are high emitters now doesn't mean that we should have a licence to say, "Well I have to cut my lifestyle more gradually to get to that fair point." (P23)

This was echoed by other CRAGgers:

... ultimately what would seem *fair* would be for us all to have that same ration. (P7)

One group that started with a fixed target has now decided after its first year to switch to variable targets. This is for practical reasons and also because they have decided that variable targets are fairer:

we decided that because we want to welcome new carbon counters as well as making further reductions for the existing counters, that we will now switch to personal targets for each member. [...] another big learning point – and a reason for personal targets – is that if you are at work you get access to heated lighted premises up to five days a week, whereas if you are retired you don't. So until all aspects are carbon counted then setting personal allowances in the group is a way of taking account of these inequities. (Redland Bristol CRAG, from the website)

In terms of the size of the 'carbon ration', most groups that have a per capita target have started with 4500 kg, a 10% reduction on a rounded approximation of the UK average for direct emissions, with the rationale that a 10% year-on-year reduction of this average is needed in order to cut emissions by 90% by 2030. This latter target was suggested by George Monbiot as the UK's fair share of the global reduction that is necessary to avoid warming of more than 2°C (Monbiot 2006). Langport CRAG have based their first year target of 8400 kg on a 10% reduction in their group average footprint instead, and Glasgow CRAG, which achieved major reductions in their first year, have opted for a second year target as low as 2000 kg, a 10% reduction on the estimated global average footprint.

Most of the CRAGgers I spoke to who had already completed at least one 'carbon year' had managed to keep their emissions within the target for that year – only four had been above the target, although two interviewees who had been successful previously were expecting to miss the target in the coming year. All those who were part way through their first year expected to meet the target.

5.4 Accounting

Most CRAGgers I interviewed do their own 'carbon accounting' using agreed conversion factors or a specific footprint calculator. The CRAG website offers a list of conversion factors and many CRAGs use this, though several have modified it to include public transport and non-zero conversion factors for wood and/or 'green electricity' tariffs. The Leeds, York and WSP groups have developed their own online calculators. Some groups have a 'carbon accountant' to whom meter readings, odometer readings and details of trips by plane and public transport are (or can be) sent in order for the accountant to do the calculations. In groups where this is not an official function, help is informally available for those who need it. At least one group requires members to provide evidence of their footprint, in the form of home energy bills and photographs of odometer readings, but all groups (necessarily) operate on trust when it comes to reporting journeys by plane and public transport. Several groups collect and publish the footprints of members so a record of the whole group situation is obtained.

Whether or how to account for children, 'green electricity' tariffs, and journeys by public transport have been sources of great debate in several CRAGs.

Of the 24 'active' CRAGs listed on the website, 12 are giving children a full allowance, at least for home energy use (it is not always clear what

happens when car mileage is being counted), while for seven groups there is no information. The other groups have adopted a variety of positions, including giving children under 16 no allowance, giving children under 12 half an adult allowance, and allowing the first two children in a family a full allowance but further children none. Two CRAGgers with children commented that they did well out of children receiving a full allowance and that they felt it gave them an unfair advantage over other members who didn't have children. One interviewee who was a member of a CRAG that has not discussed the issue of rations for children allocated all gas and electricity use to her own footprint, so in effect her child had no allowance, explaining:

I think giving children a full allowance is problematic because I don't think that children do produce that much. So for instance I currently live in this two bedroom flat; if I didn't have a child I'd live in a one bedroom flat. Now even if that was properly heated the reduction in electricity and heating from that wouldn't be massive. I mean, the amount of basic infrastructure required isn't huge. On the other hand, as children get older and you do need to do more activities with them, or their tastes and demands change then yes, I can see that there'd be a need for a more adult-sized allocation. (P14)

On the other hand, two interviewees had noticed an increase in their household energy use as a result of having a baby and one of these specifically stated that he thought it was important to take this into account:

...my baby's maybe about 16 months old and certainly since she has come along we do notice that we have, for instance, heating on longer than we would normally. I think if I had been responsible for putting [the scheme] together then I would have said to take in any children in the household into consideration as well. (P21)

'Green electricity' tariffs have created huge and detailed debates within the CRAGs movement. Many CRAGgers argue that signing up for such a tariff does not reduce one's carbon footprint since it does not create more demand for renewables than already exists due to government measures, and renewable energy generation is already accounted for in the electricity conversion factor on a carbon calculator. However, most groups want to give some credit to those who 'do the right thing' by signing up to a green electricity tariff. Three CRAGs give 'green electricity' a zero-rating, though one group intends to review this, seven groups give a discount of 5-90% for 'green electricity', and four CRAGs give such a tariff the same carbon weighting as any other. There is no information for other CRAGs.

As regards public transport, ten CRAGs include all journeys in their footprints, two do not include any, five include only 'long distance' journeys, two include long distance trips and regular commuting by public transport, and there is no information for the other five CRAGs listed as 'active' on the website. One CRAG accounts for journeys by public transport at half the usual conversion factors for buses and trains, in order to encourage switching from car travel.

Several interviewees did their accounts or monitored their energy usage more frequently than they were required to for the sake of the CRAG:

I actually have my own chart that I keep at home where every month I read the gas and electricity, transport, so I try and keep track of what is happening every month. (P5)

I'm using an online calculator called The Carbon Account and I have an account with The Carbon Account and on the first of every month I go and look at my gas meter, under the stairs, and my electricity meter and I put in the figures... (P18)

For some, it was the accounting that was a large part of the attraction of being in a CRAG:

Question: ...what is the appeal of the CRAG in particular?

The whole idea of monitoring and having some sort of measure of how much difference we are making is great. (P5)

It was partly the sort of calculated mathematical side of it that maybe appealed to me. [...] I think the thing I liked about CRAGs was there was a genuine effort to calculate exact numbers and so on, and so we could all have information about what a real impact on the climate is... (P15)

5.5 Financial penalties/Trading

Of the 24 'active' CRAGs listed on the website, 14 definitely have a financial penalty for exceeding the carbon target, ranging from 2p to 10p per kilogram, with Leeds CRAG allowing members to choose their own penalty. Many of these groups cap the amount that an individual has to pay in any one year (typically at £100). Two CRAGs allow over-emitters to do voluntary work in lieu of paying the financial penalty. Seven CRAGs have chosen not to have a penalty, and for three CRAGs there is no data.

Only two CRAGs are definitely operating any form of carbon 'trading', where under-emitters receive payments from over-emitters. Six groups have decided instead to give any monies accrued from over-emitters to carbon reduction projects, environmental charities, or 'good causes'. Four groups have yet to decide what to do with their funds, but appear to be considering supporting offsetting projects or environmental groups rather than financially rewarding under-emitters, and for one group there is no data. The WSP scheme does advertise a financial reward for under-emitters but it is not clear where funds for such payments will come from, as it is intended to spend the 'carbon fund' generated from fining over-emitters on carbon reducing measures such as the purchase of energy-saving equipment for staff. No trading system has yet been set up.

CRAGgers I spoke to gave various reasons why their group had decided not to have a financial penalty:

I think they felt it was too sort of Big Brother [...] we were there to encourage each other but not to police each other. (P8)

...we decided not to have a financial penalty because of people's different financial situations. (P12)

The idea of a fine for going above a certain amount was thought that it would put potential members off. (P18)

Similarly, there were various reasons why CRAGs with a penalty had decided not to give the money to under-emitters, effectively imposing a carbon tax rather than a trading system:

...we pretty quickly dismissed the giving money to other members of the group because those of us who were under-emitters weren't that bothered and the over-emitters thought that's not a great use of their money. Fair enough. Plus, those of us who are under-emitters were partly because we'd already done all the cheap measures in our houses, it's not like we could use the money to buy a load of efficient light bulbs or loft insulation because we've got all that stuff already [...] we decided we wanted to do the thing that gave us the most carbon offsetting for our money. (P2)

We felt that there was no point paying money to a well-off middle-class person. (P11)

I think nobody wanted to be over the limit and the people who anticipated that they would be under the limit didn't want to be seen to be gaining financially [...] we didn't particularly want to force people to give money to one another or even to an independent cause like offsetting or something because we didn't really see it as appropriate for an organisation that didn't have a constitution, that didn't have any legal basis... (P15)

There seemed to be a general 'embarrassment factor of gaining at somebody else's expense, especially somebody who knew that you were and who you knew' (P9), suggesting that trading requires anonymity.

The two CRAGs which operate a (necessarily rudimentary and limited) form of carbon trading are Glasgow, and Hackney and Islington. In each case the financial penalty is fixed (at 5p/kg) and financial settlements take place at specified intervals. In a national PCT system the carbon price would depend on the market (and therefore fluctuate) and trading would take place in real time.

In Glasgow CRAG, monies collected from over-emitters are distributed to under-emitters in proportion to how far under the target they finish the carbon year. They therefore do not necessarily receive the same price per kilogram of CO₂ saved as the over-emitters have to pay. In the first year of operation, six under-emitters received less than 0.2p/kg from one over-emitter, who had to pay at a rate of 7p/kg. The over-emitters in this scheme are not really buying carbon credits from the under-emitters. One member of the CRAG said that the trading aspect had become less important to him than it was initially, and unimportant compared to the fact that the group has demonstrated that it is possible to make substantial emissions reductions over a short period.

In Hackney and Islington CRAG over-emitters do buy carbon credits from under-emitters. This system differs from proposed national PCT schemes in that under-emitters are *required* to sell their spare allowance in proportion to how much they have saved (lowest emitters must sell most). Any spare allowance that an under-emitter has left once they have sold whatever is necessary to 'balance the books' of the over-emitters may be saved or retired. However, the requirement to sell would make it difficult to save up enough credits to cover a carbon-intensive activity such as a flight to Australia, should a CRAGger wish to plan ahead for such an eventuality. This system has worked so far because during the first three six-monthly settlement periods under-emitters have saved more CO₂ than the others have emitted over the target. Problems will arise when the reverse is true.

Many CRAGgers I spoke to who were members of a group that had a financial penalty did not think that it had affected their behaviour, partly

because the penalties are still quite small (though considerably higher than the market price of carbon):

We had kept the financial cap the same of £100, but we had reduced the allowance. So then to me I didn't find any incentive in that any more because I knew I am still probably going to be [paying] just the £100. (P1)

...an extra £50 is neither here nor there. It's not going to affect whether I decide to go flying or not so I said, "You're going to have to double it or more to make it affect my behaviour"... (P16)

And to some extent because the penalties are going to be very low, because we wouldn't be going over by that much, I'm not that concerned... (P20)

When this last interviewee was asked whether a larger penalty would have more an effect for him he replied:

It would focus my mind. I wouldn't be content to just let things drift and think if it's a little bit I'll pay. I would have to actually sit down and work it out and that would be good. (P20)

Other interviewees felt that although the possibility of receiving money did not drive behaviour changes, having to pay out might be more of an incentive:

I think really people feel a bit embarrassed about [receiving money]. I don't think anyone has kept the money for themselves although they are quite at liberty to do so [...] So it's not the incentive of gaining money but I think there is some incentive in shelling out money. (P23)

[Receiving] up to a maximum of £50 over a year, it's nice, don't get me wrong, I'm not going to say no to it, but it's not going to change things really. Having to pay it though at the end of the year might have more of an impact, taking money out of your own wallet to give to the cause would have more of a motivation I guess, for me to come in under the recommended amounts, rather than getting money at the end of it. The fine is scarier than the reward I guess. (P22)

This latter interviewee, however, also stated that although he would be willing to make some changes to his lifestyle, he would not be willing to cut out holidays which involve flying, suggesting that the incentive of the financial penalty might be limited. Those I spoke to who did actually have to pay, or thought it likely they would have to, seemed happy to do so, though one interviewee did suggest that at least one person who dropped out of Glasgow CRAG might have done so because of the prospect of having to pay heavily as a result of a taking a long-haul flight during the year.

When it came to the question of whether they would trade within a national PCAs system, several CRAGgers who would clearly have spare allowances to sell, at least in the early years of such a scheme, said they would not do so on principle, or would only sell if they were convinced that the national cap on emissions was low enough:

...it would depend [...] on what the overall budget was. If we had a situation like we have with the phase one ETS, I wouldn't [sell my spare allowance]. Because it's far too high and it's almost meaningless, the only way you can make it meaningful is by destroying the credits. (P4)

I don't think I'd want to trade it because one of my worries is the whole issue of global warming and if you trade it then you're merely allowing somebody else to use more. (P8)

...I'd like to put them under my pillow and say "nobody is going to emit these, I'm not going to give these to the Merc owner or the meat eater down the road" or whatever it

is they would spend their carbon emission allowances on, and if a lot of people did that it would help to drive the price of a unit of carbon up, which would be a good thing because prices are a good way to help people reduce their emissions, or change their ways. (P18)

Other interviewees said they would not be willing to sell any spare allowances on an open market, but would consider giving them away or selling them to people for a 'good cause':

...so it's either keep them or I would be happier if there was some scheme that said "OK, so if you under-use you can trade those and we will use those towards a greater cause." (P12)

...you might choose who you sold it to if you had that ability. Why sell it to somebody who's just going to go on a cruise around the world [...] if you could sell it to the old people's home down the road [...] even sell it there at a discount... (P11)

I'd make sure they were either kept out of circulation altogether or I gave them to someone who really needed them. (P23)

A couple of CRAGgers said they would save their spare allowances in order to be able to fly in the future. A minority of interviewees were happy to trade within a national system and said that whether they sold or saved any spare allowances would depend on the carbon price and what they expected their needs to be. One CRAGger offered the very unusual view (among members of the movement) that it would be wrong to 'retire' space allowances:

I think it would be immoral not to [sell my spare allowances]. What I really think, because you know they talk about "oh well you should be tearing up your carbon rations" but no, you shouldn't. [...] If enormous quantities of these things get bought up and torn up and they can't be used, you're likely to have a collapse of the economy. (P16)

One interviewee said that if he found himself going over the national allowance he would "find it quite hard to justify why I'd have to pay or make an effort to get more" (P22) but this was an atypical view.

Despite their reluctance to trade within such a system, just over half the interviewees expressed qualified to enthusiastic support for the introduction of a national PCAs scheme in the UK. One of the main reasons that it found favour was the perception that it would be a redistributive policy:

I think it would be a great equaliser, something like that. (P10)

...it would be a very redistributive measure nationwide and also globally once you got onto it. (P20)

The 'embarrassment factor' of trading within a CRAG would not be a barrier in a national scheme:

I think if it was a national scheme [...] that I would feel that that was actually okay, because there wouldn't be this "I'm doing it to you my neighbour" sort of factor. (P8)

There were concerns, in this group of supporters and among the other interviewees, about public or political acceptability:

Well, if you could convince everybody it was a good idea it would work, but I don't think you could convince everybody it was a good idea... (P4)

about the practicalities of implementing a scheme:

...coordinating it and setting the boundaries to it, establishing those, it's going to be quite a challenging task to implement... (P13)

and about issues of fairness:

...it would have to be quite complicated in order to make sure that people weren't losing out unfairly, so people that were living in the countryside, somebody with... they probably don't call them iron lungs any more but whatever it is, if you had to turn off your iron lung because you didn't have the carbon ration to pay for it... (P5)

Somebody who's not very bright, who lives in poor housing, it's not really their fault if their gas bill turns out to be astronomic. (P11)

I think with carbon rationing you would have to have a lot of education and lots of checks and balances in the system. To make sure that it didn't happen like in the stock market. Poor little old grannies would sell off their shares for a song to unscrupulous stockbrokers... (P23)

Other interviewees raised concerns about carbon trading in principle:

Well carbon trading is seen as a way for capitalists and speculators to make money, isn't it? Any trading, any market, is a way of making money at the expense of others, using market power. I'm sure the carbon markets will be – are and will continue to be – exploited for minority groups, in favour of minority groups and interest groups, and that's not very palatable to a lot of people. (P17)

A couple of interviewees had decided that an upstream 'cap and share' system would be preferable to PCAs because of the lower cost or because they saw it as a more realistic way forward politically. (Influential environmental writer Mark Lynas has also come to this conclusion (Lynas 2008), while others such as George Monbiot (2008) who used to promote PCAs are now backing Oliver Tickell's Kyoto2 proposal (Tickell 2008) for auctioned upstream emissions permits, with revenues used for mitigation and adaptation measures.) One CRAGger preferred the idea of environmental taxation because he saw allowances as too controlling. A small number of interviewees were confused about how a national PCAs scheme would work, imagining that participants would have to record their energy usage as they do in a CRAG, or that there might be a financial penalty for exceeding the allowance but no reward for using less.

5.6 Carbon literacy

Increased carbon literacy was perhaps the most obvious outcome of involvement in a CRAG. Most interviewees said that they now have a greater understanding of where their emissions come from and the relative impact of different activities than they did prior to joining the group (including the climate change academics and the energy consultants):

...it is a very positive thing to be into initially because it gives you a good overall understanding of where an individual clocks up his carbon footprint. And it's quite startling. [...] I think everybody has a vague idea but until you actually get down and do it... and the comparative thing is useful. (P11)

I had no idea what I was doing before this, what's below average or below targets. [...] I didn't know how much carbon I was producing per 100 kilowatt hours or whatever of electricity I was using, so yeah, it's been quite helpful and it has really shown me how much taking an aeroplane flight to Egypt my last holiday had such a big impact on my overall carbon emissions, it was surprising. [...] it's just helped really, visualising what causes the most problems and what doesn't really from my point of view anyway. (P22)

Two interviewees mentioned that they had an energy monitor which had given them much more information about their emissions. Those who didn't think they had learnt more about their emissions said that was because they had already known a lot beforehand, rather than because the CRAG did not provide them with information they needed, or because they could not understand the accounting process or the resulting footprint.

As well as increasing understanding, interviewees reported that they had become much more aware of their energy use; in other words, they were making everyday connections between the information they were taking in and their behaviour:

...we are very much more aware of fuel usage. For instance, we're got a gas bottle cooker and [...] when a bottle of gas runs out as it has today, in the middle of cooking dinner, we write it down on the calendar so we've got an idea of how long they're lasting. (P10)

I'm actually only doing [carbon counting] every quarter but I have to say I'm more aware of my behaviour. (P13)

Interviewees also found that they were becoming more knowledgeable about, or aware of, indirect emissions:

...being a part of [the CRAG] has raised our awareness of all those other things that involve energy. (P7)

...one of the things that I did take out of the CRAG is that I realised that consumption of meat and overseas food was a much bigger deal from a carbon creating point of view than I realised before. (P15)

Some interviewees found that being in a CRAG has enabled them to see more potential for reducing their emissions than they thought there was before they started:

I think we were very cautious at the beginning about what we thought was possible. I [...] thought that we would have to really ease ourselves into it, and so this idea of a little percentage per year, that seemed manageable. [...] I hadn't actually realised that you can do quite a lot quite fast... (P17)

Question: Have you actually done more than you thought you could?

Yeah I have. Simply because one becomes so conscious of it. (P23)

This was not the case for all interviewees, however; some knew what was possible before they started and the CRAG simply helped them do it, whereas others thought that they had already done what they could and did not discover otherwise through their involvement in a CRAG.

5.7 Emissions reductions/behavioural change

Using data from five CRAGs (Oxford, Hereford, Leamington, Glasgow and Sevenoaks) that have posted figures on the CRAGs website³ for group/individual emissions both for the year before they started in the CRAG ('baseline emissions') and for their first carbon year, I calculate that the members of these groups reduced their average per capita footprint

³ www.carbonrationing.org.uk

by 27% in their first year, from 4.9 tonnes down to 3.6 tonnes⁴. This average 3.6 tonne footprint is 31% below the UK average of 5.2 tonnes for direct carbon emissions (excluding emissions from public transport, which some of the CRAGs include in their calculations but others don't, or only partially). The average baseline footprint was 6% below the UK average. Members of these CRAGs were not, therefore, starting from an emissions position very significantly differently from other members of the general public. To give an idea of where we must get to, an 80% reduction by 2050 means that individuals must have a footprint of no more than 1.1 tonnes of CO₂ from their direct energy use (Hillman and Fawcett 2004).

Interviewees had generally already started trying to reduce their carbon emissions before they got involved in a CRAG. Many had lower than average emissions at the time that they got involved, and quite a few were already under the target that was set for their group. Nevertheless, most felt that they had continued to change their behaviour and reduce their emissions further since becoming involved in a CRAG. It is important to note, however, that not all interviewees attributed these changes to their involvement with the CRAG:

Mainly, it's not because I'm in the CRAG but because I'm seen as a leader in climate change campaigning that I felt it would be hypocritical to replace [my car]. (P16)

...it's something we were doing before this started really. (P22)

Others thought that although they would have made changes without the CRAG, being part of the group did make a difference:

I am probably going to make a load of changes to this flat and to the house it's part of in order to reduce carbon emissions, but I would probably be doing that anyway whether I was in the CRAG or not. The CRAG has basically accelerated everything really... (P3)

...we would have made those [decisions] without being in a CRAG but I think it is influencing our behaviour. I suppose you sort of say, "Oop" occasionally if one's tempted to drive somewhere instead of maybe catch a train when you could and it's sort of "Oop, wouldn't want to tell the CRAG group we'd done that!" (P8)

...without [the CRAG], I don't know, maybe I would still be living like this but I know that I have benefitted from support and just having other people who are reinforcing your behaviours and your feelings and thoughts about things. (P17)

Still others were clear that the changes they have made are a result of involvement in a CRAG:

In one way this has had a disastrous effect in that my wife has now decided she won't fly at all... (P11)

...we have consciously made decisions and made changes...I am not sure I would have done that had we not joined the group. (P12)

Two interviewees who had not reduced their emissions since they joined the CRAG said that this was because their emissions were already so low when they started that there was little more they could do.

⁴ This assumes that the baseline figure for the 33 members who calculated it is representative of the baseline emissions for all 49 members who then recorded their emissions during the first carbon year of their CRAG. Note that my figures are not exactly the same as those in the 'CRAG census' on the website, which includes groups for which there is baseline data but no first year data and vice versa.

The following details of behavioural and/or technological changes that interviewees engaged in include all those mentioned, which may have been made before involvement in a CRAG, or were not necessarily the result of such involvement.

Transport

By far the most frequently mentioned behaviour change was cutting down or giving up flying. All but five interviewees mentioned that they do not fly (or had not for some time), had cut down on flying, or intended not to fly in the future. Indeed, whether a CRAGger flies or not seems to be a key factor in whether they will achieve the target or not, in most groups. Three of four CRAGgers who had not met their target in a previous year, and both interviewees who expected to be over-emitters in the current year attributed this to taking flights.

...it was almost like [flying] just pushed you over your allowance right away. (P1)

My major thing was stopping flying. That was really what changed in one fell swoop, and enabled me to come in under figures. (P23)

Two interviewees, by contrast, mentioned that they were planning to continue to fly for holidays. Both belonged to the WSP PACT scheme. The WSP PACT footprint calculator apparently does not include the multiplier for CO₂ produced by aeroplanes that other CRAGs use to take into account the effects of altitude and of other greenhouse gases emitted by planes. Flights therefore have a significantly lower impact on the overall footprint of WSP PACT members than they do on other CRAGgers.

In terms of reducing emissions from surface transport, several interviewees had again made behavioural changes. Three had got rid of their cars, one had bought an electric bike and used that to commute to work instead of the car, two mentioned getting involved in lift-sharing, and one person had chosen to cycle more often rather than using the underground, since even public transport emissions can mount up after time. Others mentioned more generally that they try to avoid or limit car travel. One couple had deliberately moved closer to their children to cut down travelling, another had chosen the location of their home partly so that there would be no need for a car to get to work. One interviewee said that his wife had tried to get a job nearer their home in order to cut emissions from commuting, and another that he was considering relocating his work so that it was closer to home.

Others had tried technological changes: one interviewee was running her car on biodiesel made from used oil and another had tried to do so (unsuccessfully), and one had bought a new, more efficient car.

Home energy

Two interviewees had had wood burning stoves installed to heat their homes and one had converted the household Rayburn from oil to wood. In each case they burn waste wood that they collect themselves (two in a city, one in a rural area). Six interviewees mentioned fitting or improving insulation. Three households had installed solar hot water systems, and

two others were seriously considering doing so. One couple were looking into the possibility of getting a wind generator. Two interviewees had installed secondary glazing and others mentioned energy-efficient light bulbs. In terms of appliances, three CRAGgers had replaced their fridge with a more energy-efficient model, one had swapped a desktop computer for a laptop, which uses less energy, and one had bought an eco-kettle. One interviewee said that one of the considerations he and his wife bore in mind when buying their new house was that it should be more energy-efficient than their previous dark, cold cottage.

Behavioural changes in the home that were mentioned included turning down the heating or using it less, turning lights and appliances off when not needed, and using appliances less.

A couple of interviewees had noted that a big factor in the household energy footprint is the number of occupants of a house, and one had moved to live with other people, having previously lived alone, partly in the hope of reducing his footprint.

Other emissions

Although none of the interviewees belong to CRAGs which include indirect emissions in the accounting, some mentioned ways in which they try to lower these emissions, mainly when buying food:

I think a broadly vegetarian, broadly local diet and try and cut down on food packaging and supermarket food is the way to go... (P15)

We consider food miles a lot more... (P20)

and also by buying goods second-hand, composting waste, and not buying unnecessary items. One interviewee had had a vasectomy, and although financial considerations had been the main driver for this, he also regarded not having more children as a way to limit emissions.

The experience of reducing emissions: easy changes and barriers to action

By far the most common barrier to making changes mentioned by the interviewees was cost, generally of home energy improvements or renewable energy technology:

...we're not prepared to do things like buy electric PV solar panels, because it just doesn't make any economic sense at the moment. (P4)

We would have replaced the boiler except we ran out of money. (P5)

...putting in insulation or things like that would be way beyond our means... (P20)

Another barrier is the type of house occupied, which makes energy conservation or technological improvements difficult:

We're in an 1880 house so a lot of the things aren't easy. (P11)

or the living situation:

I was limited a little bit [in cutting energy use at home] because I lived in a shared house. (P1)

...if you are renting a property then it is hard to insulate... (P15)

A couple of interviewees also mentioned that their heating needs had increased because of working at home or being in more after the birth of a baby.

When it came to transport, a few interviewees felt they could not give up flying completely, although they had cut down, because of family commitments: having family living abroad, a family funeral, an agreement to holiday with the family. The cost and 'hassle factor' of travelling by train rather than flying was also mentioned:

We looked at trains but it was impossible to [do the journey] without buying four separate tickets and each of them had their own booking horizon and each of them may get it at the cheap rate but it may cost loads of money... (P16)

The need to drive for work or other reasons was also an issue for some, especially in rural areas:

[My husband] is working for two fairly local jobs in rural terms but there's no way he could do them without taking the car. (P8)

...when we first joined [our son] was three and he was still at home and now he's going to school and transport, it's just pushed ours up [...] There is no bus routes within two miles of here, so we have to drive everywhere so that's the biggie for us. (P10)

A few interviewees had experienced conflict with friends or family members over their efforts to reduce their footprint:

...I think now [my wife] has seen the positive benefits then yes she supports it but if I dream up something new which will either save the planet or save our bank balance or something else, she rolls her eyeballs and thinks 'oh my God, now what?' We don't have the same forward thinking on sustainable issues at all. (P19)

...very soon after I started in the CRAG one of my close friends got married in India, so that was a bit difficult. So I had to explain to her why I had chosen not to go to India for her wedding. She was very understanding about it but I'm sure she was somewhat offended. (P23)

This was a source of difficulty but had not actually prevented interviewees from making changes in their homes or lifestyles. However, several CRAGgers did comment that they would not have been able to make the changes they did without the support of their partners.

Several interviewees said that they have found living a lower carbon lifestyle easy, and some have discovered positive benefits:

...we have just looked at alternative ways [of travelling] and I think to be honest to date we've found it a bit of an adventure and quite exciting. (P6)

...there's good things and there's bad things and actually some of the advantages like just spending time with the children when we're travelling on buses or walking or cycling and trains is much more pleasurable family time than strapping them in the back [of a car] and turning up the story tape or whatever. (P16)

Obviously if you can reduce your energy use, you reduce your cost, you reduce your emissions [...] the most obvious thing that I try to do is switch things off, it's just so simple and straightforward... (P21)

Some interviewees considered that reducing emissions from home energy use was easier than reducing their transport footprint, while others had found the opposite.

The need for legislation, infrastructural changes, and grants to enable individuals to cut their emissions was touched on by two interviewees:

...it seems to me more and more important that we get legislation, and for me the meaning of being in the CRAG now is not so much about a DIY philosophy; some people in the CRAG will probably argue that we need something to change from the grassroots and this is one way of doing it, and I wouldn't disagree with that itself, but I certainly think it's fairly futile without change from the top as well. And our budget is probably a good example of that; we're not going to get much further until there are infrastructural changes made. (P4)

But we're still interested in getting insulation on the house and I'm hoping that the government will bring in a grant for doing external walls [...] once they give us a grant we'll be able to afford to do this... (P18)

5.8 The significance of being part of a group

Of course, increased carbon literacy and behavioural changes leading to emissions reductions can be achieved without joining a CRAG, and especially given that many interviewees were already making such changes before getting involved in the movement, a key question is whether, how and why being part of a group helps CRAGgers attain these aims.

The groups differ in how they were set up: a few are composed of people who mostly knew each other; others involve members who were strangers at the beginning. The biggest difference is between WSP PACT and the other CRAGs. The former involves members who do not all live in the same area, unlike other CRAGs. Participation within the scheme is limited to submitting personal energy-use data and receiving feedback about one's carbon footprint compared to the target, all done electronically. Members do not necessarily know who else within the company is involved, and do not meet together face-to-face or take part in internet-based forums as part of involvement in the scheme, although one WSP interviewee had had informal discussions with colleagues about their emissions as a result of being part of PACT. Generally, there is very little of a 'group' element to this workplace-based scheme, and it is notable that interviewees from WSP mentioned increased awareness and understanding of their emissions as benefits of being involved in the scheme, but not the other advantages discussed below.

Interviewees who had formed/joined a CRAG where they already knew most of the other members suggested various benefits:

It means that we know where a lot of people are coming from. (P5)

...by knowing people, it accelerated the set up in that we knew each other well enough to be quite open and frank and clear about what we wanted to achieve with it. (P6)

...we share a lot of common values already and we are able to give each tips... (P10)

although one person saw it as a downside because it meant the group involved just the 'usual green suspects'.

Interviewees also saw positives in belonging to a CRAG composed of people who had not known each other: such a group brought together people from different backgrounds, and with a wider range of perspectives than a group of friends would have, they felt. Interviewees from one group had found they attracted more people than expected by advertising

for members locally. Negative aspects of such groups included the perception by some interviewees that the group was not as sociable as it might otherwise have been, and that there was no ongoing conversation about aspects of CRAG management because members did not see each other apart from at quarterly meetings. One interviewee had found it harder to start a new CRAG without the help of friends that he had had before in a different area.

One of the most frequently mentioned advantages to being in a group was variations on the theme of 'moral support', whether through appreciation of their efforts by other members, a sense that they are not alone and group efforts are less insignificant than an individual's, the enjoyment that comes of being with like-minded people or the therapeutic value of the group:

...one of the key things about the project, I think, for those of us who are in it, is just to share the process and to be able to tell people simple things, like you might feel a bit bad about taking a flight and I think it's almost therapeutic for some people to come and tell people that... (P4)

...one of the reasons I've found getting involved with CRAGs so exciting is that it's enabled me to meet lots of other people who I wouldn't have met and to realise it's not just me who's concerned about this, there's a whole body of people out there working on this and that's really quite empowering. (P14)

I just love it and last meeting was a really good opportunity to be able to get encouragement if you're finding it difficult. (P16)

I feel like I'm now in some kind of community of people that have the same concerns and interests [...] the CRAG has kept me involved in a scene over an extended period now and provided a context for me to learn, and reinforce the changes that I decided were necessary. (P17)

...being able to be in a group where I'm not regarded as a weirdo and I'm regarded, perhaps, as somebody to be looked up to and can provide information about how to be green, is quite attractive. (P18)

The other most frequently mentioned benefit of belonging to a CRAG was the potential for sharing information:

I certainly think that I have found out information at the CRAG that I wouldn't necessarily have found out otherwise, just from people trying things out in their own houses and telling us. Insulation materials, where to find things, gadgets that help; really practical basic things like that. I don't know if I would have actually managed to find those things myself. (P4)

...there's just a need for local groups where people can just go and talk about this stuff and find out about it [...] that's partly why we get such a high throughput of people who come, because there's just nowhere else for them to go at all [...] they've just been people who wanted to know a bit. (P14)

About a quarter of the interviewees mentioned that they find the sense of accountability to the group helpful:

...you open your mouth in a meeting and say "oh right, I'll have to do that" and then people will ask you next time if you did. [Laughs] So definitely, yes, it does help being accountable... (P4)

that they appreciate the opportunity to encourage and influence others:

...this is a really good way of touching lots of people in a sociable way and getting people in action who might otherwise not be in action about it. (P6)

and that they enjoy the social aspects of being part of a group:

We've enjoyed it socially haven't we? We're living here in rural isolation and so it's been a good regular get-together with friends of ours to talk about something that matters to us. (P7)

...it's in fact turned out to be a good way of meeting people with shared interests. (P9)

Further advantages of being in a group rather than acting alone mentioned a few times included a helpful sense of competition or comparison with others:

...there is a slight element of competition. It's interesting to see who can come out lowest. (P23)

the discipline or sense of focus brought by commitment to a group:

I suppose it's sending a signal to myself that I am taking things seriously. [...] I've got too many meetings already, so if I agree to do something else it means I am taking it fairly seriously. So yes, I think it had helped concentrate my mind a bit. (P5)

It's discipline. I think it's all too easy to be distracted when you are left to your own devices... (P12)

the greater influence that a group has:

...by having a structure and a name and quite an innovative idea, it's also given us as environmental campaigners or concerned citizens some credibility with the local council, with the local environmental network [...] we do get invited and included and referred to. (P6)

the opportunity for involvement in activities beyond personal carbon counting/cutting:

...there's people there who are trying to push the ideas in various ways, going on marches and having little work groups and doing things like that so there is this kind of sense of the wider activity out there. (P2)

... right from the outset I felt encouraged by people's evident interest in taking the whole thing further and actually wanting to do positive things on a community basis, influencing things at a community level. (P9)

Like the contact with the school, and then it's come up in the village hall committee whether or not we couldn't have solar collectors on the village hall roof which is a huge south-facing roof. (P8)

... we've had several discussions about change of lifestyle in the event of oil depletion for example. (P12)

and the benefits of being connected to a national network:

...there is an online [website], carbonrationing.org, which I don't look at that often but it is actually quite a nice sense of community and occasionally I do get email messages through that from other CRAG people... (P2)

...the website and all the stuff that people put on there that's good and interesting: news items and facts and figures, so there's a resource that we wouldn't have on our own... (P17)

though one interviewee saw the latter as a problem:

Also one thing I found with being involved in the CRAG network across the UK is they send you loads of emails, hundreds of emails, and then I was getting 30 a day at one point, debating whether tomatoes are better than apples from a carbon output point of view and other minority interest topics like that. (P15)

Interestingly, all three interviewees from Oxford CRAG, which appears to have fizzled away, said that since they had been unable to attract new members, the group had perhaps served its purpose after two years of operation. Members had learned from the experience but there was no longer enough of a benefit to being in the group to keep enthusiasm and

momentum going. This was attributed, in part, to the fact that members were busy, or had moved away, or were getting involved in other groups, and so was not necessarily due to there being little point to the group once initial learning has taken place. It could be argued that if one aim of grassroots groups such as CRAGs is to demonstrate their success or otherwise to government, then the short life of some groups would be a point against them. However, the real question is whether members of CRAGs maintain or even increase their emissions reductions over time once the group has disbanded. It is too early in the history of the CRAGs movement to assess this properly.

5.9 The limitations of CRAGs

When invited to comment on any limitations of CRAGs, or any ways in which their hopes or expectations of involvement in the group had not been met, interviewees most frequently responded that they were disappointed that there were not more people involved, either in their own CRAG, or in the movement as a whole. It seemed to them that there were not enough CRAGs, that new CRAGs had trouble getting going, and that the concept had limited appeal. Some felt that their group struggled to draw new people in because existing members did not have the time or energy to devote to that.

Problems with group processes were also mentioned, including poor organisation, meetings at which little is achieved, too much concentration on influencing others rather than on how members themselves could reduce their footprints (only one person mentioned this), and not enough of a social element to the group:

I think that celebrating humanity and each other and enjoying ourselves is, perhaps, quite important whereas the CRAG may have been a bit dry and narrow in its focus. (P18)

Interviewees also saw limitations in the accounting process, both because it only includes the direct emissions that individuals are responsible for, and because the conversion factors used are imperfect:

I think the process is flawed and it is a bit limiting because it doesn't cover food and that's a big issue for us [...] so that was a bit disappointing, that we couldn't find a way around including that. And also, even though I've said the figures were really good because they give you an illustration, they were limiting as well because, for instance, wood was zero-rated. Green electricity is zero-rated. (P10)

Sometimes I think, wouldn't it be nice if all of my effort of not buying stuff were appreciated [...] I just find it frustrating that you can't tell how much difference you're making. [...] When I wear second-hand [clothes] how much am I saving then? (P16)

...my own personal preference would be to have [the footprint calculator] based on the CO₂ emissions of the car rather than breaking down on 'medium size', 'small size', but then that's probably a bit too technical for the majority of people. (P22)

As has already been mentioned, a couple of interviewees with children thought that they had a rather unfair advantage over other members of the CRAG because they received a full allowance for each of their children, and one felt that this led to "skewed incentives" because taking her family somewhere by car counted for less on her carbon footprint than going by

train, whereas she thought that travelling by train is the more environmentally-friendly option (P16).

A few interviewees also mentioned the problem of CRAG members not actually getting around to calculating their carbon footprints.

The particular case of a CRAG that didn't get off the ground: Edinburgh

One interviewee had tried to start a CRAG in Edinburgh, which met only once and “petered out within a few months of it being set up”. There are perhaps interesting lessons to learn from such an example of an unsuccessful CRAG. The founder thought that the main reason for this failure was that there were so few people who got together to form the CRAG. He also felt that there was a “lack of social affinity” between the people who had come to the first meeting, since they were people of different ages and walks of life. He suggested many reasons for the lack of interest, including the fact that “the sort of people who might want to join a CRAG are already doing everything they can [to reduce their emissions]” and that there are a lot of other environmental organisations in Edinburgh. CRAGs may not seem different enough from these other organisations, or their purpose may not be clear:

...I think the CRAGs are seen as just another environmental thing that you can choose to do rather than as being a distinctive movement and a way of demonstrating the viability of carbon rationing. I think some people maybe see CRAGs as either a cynical way for some people to make money or they might see them as just another good cause, or even just another bit of greenwash that isn't central to the idea of reducing the UK's carbon output and whether that is misinformation or whether that is an accurate view of CRAGs I don't really know.

He also thought that people might think it invasive or unnecessary to reveal and discuss details of their lifestyle in a group of strangers, or might consider it “voyeuristic almost or self-congratulatory”.

Another factor was that he thought he might not have recruited potential members as effectively as possible, for example, by not sending emails to the right contacts.

Then, when the group gathered:

I wasn't able to find anyone that was prepared to help with the task of making the CRAG an ongoing lively project and so we didn't meet again. We exchanged a few emails. [...] I felt we would hold another meeting if maybe somebody had contacted me and said, “Let's get back together and see how we are all getting on”, but nobody wanted to. Nobody emailed me and I didn't want to put too much of my energy into it... [emphasis added]

This point is, I believe, significant. When I attended the first meeting of this Edinburgh CRAG myself about 18 months ago I wondered whether it would survive. The meeting was brief, business-like and practical, with no social element and little discussion. A carbon ration for the year was agreed, and some rules about what would be counted. The plan was then for members to go away, keep records, and meet again after a year with results in hand. Without regular meetings planned between the yearly accounting sessions, this CRAG lacked the moral support, information sharing and other functions that most CRAGgers reported as so useful

about being part of a group. It is hard to see how such a set-up could have engendered a sense of commitment to Edinburgh CRAG, or done much to help members make emissions reductions. (This is not to criticise the founder, who, as he stated, did not have much support.)

6 Discussion

Before considering what conclusions we may make from this study, it is important to note that it did not involve a big enough sample to draw any very firm conclusions, and the sample was certainly not representative of the general public. This was, in general, a group of motivated individuals who were committed to emissions reductions because of their concerns about the environment and their values, and who were willing to give some time to achieving reductions. We cannot assume that their opinions and their experiences of attempting to reduce their emissions will extend to UK citizens as a whole should a national, compulsory PCAs scheme be instigated. However, these opinions and experiences do suggest some interesting issues to consider.

6.1 Rations/Targets

The choice of variable targets rather than one fixed ration in some CRAGs suggests that not every member of the general public will consider an equal per capita allowance fair or desirable, one of the central claims made by proponents of PCAs. This accords with results from recent research involving focus group discussions of PCAs (Howell 2007, Owen et al 2008) and an online poll by IPPR (report yet to be published). There it was found that some participants were concerned that the needs of particular groups such as elderly people would not be taken into account under an equal per capita allocation system, and argued that certain groups should receive higher allowances. At the end of an extensive study of the literature on distributive justice, Starkey (2008:55) concludes that:

The only justification for EPCA [equal per capita allocation] is that, whilst it is not the fairest of all allocations in theory, it is the fairest in practice. However, [...] the fairest-in-practice justification is unlikely to hold for EPCA between nations and is not clear that it holds for EPCA within nations.

In the present study, some CRAGs had chosen to allow variable and even self-chosen rations for the purely pragmatic reason of encouraging participation. They would not necessarily argue that their system is fair. But others may regard their system of variable targets as more equitable than a fixed ration. This is certainly the case with the Redland, Bristol CRAG quoted above (see section 5.3). It is possible that lobby groups such as those working for the interests of senior citizens (or other vulnerable groups, such as disabled people) could oppose the idea of equal per capita PCAs in a national scheme, and that there would be some sympathy for their position. On the other hand, if the general public were to understand that the allocation of larger PCAs to some citizens would automatically mean smaller allowances for everyone else, unlike in CRAGs, the debate could become very complex. Another possibility,

discussed for example by Seyfang *et al* (2007) would be some form of compensation for certain vulnerable groups in recognition of their extra needs (eg. through the benefits system) or government grants to improve energy-inefficient housing, although such intervention would be costly.

Similarly, the decision by most CRAGs to effectively give children a full carbon ration may indicate that proposals for a compulsory system that would give children only a partial allowance, or no allowance at all would be unpopular. Again, in CRAGs this choice did not mean that the standard allowance was smaller than it would otherwise have been. If it had, there might have been more debate about the issue of child allowances, and some different decisions. As it was, a couple of CRAGgers with children had observed the inflated effect that full child allowances had, and the potential perverse incentive it provides for larger families. It is hard to know how the debate between households with children who would stand to gain from full child allowances, and those who would lose (especially single senior citizen households) might shape in the national arena. Fleming (2007) asserts that an increase in child benefit would compensate families without the need for carbon allowances for children but provides no empirical evidence that this would be effective or acceptable.

6.2 Accounting

This group of knowledgeable, well educated CRAGgers generally had no difficulties doing the necessary carbon accounting, although it should be noted that there was at least one member of the Glasgow group, and one Oxford CRAGger, who did not calculate their own footprint because they felt unable to do so. The accounting required from individuals in a national PCAs scheme would be more similar to monetary budgeting, since there would be no need to calculate one's carbon footprint as emissions would automatically be calculated and deducted from one's allowance using a carbon card when purchasing electricity or fossil fuels. Since the interviewees were unrepresentative of the general population it is not possible to draw any conclusions from this study about whether carbon budgeting would prove to be easy or difficult for the general public. It might be expected that a similar proportion of the population would have problems budgeting their PCAs as currently get into difficulties with their monetary budgeting. Under this assumption, Roberts and Thumin (2006:22) estimate that 'there may be less than 20% of the population who would find it difficult and problematic to keep track and 'make ends meet'.'

However, it has been argued that there is the added complication that PCAs could effectively be used as a parallel currency and individuals might want to take into account the financial implications of the timing of selling and buying additional allowances. The potential for trading 'is not easily analogous to money management (since most people do not regularly buy or sell shares)' argue Roberts and Thumin (2006:23). This aspect has led one leading commentator to argue that we would 'need to become a nation of carbon currency speculators', which he doubts people have the ability to cope with (Lynas 2008). Other commentators argue that since

PCAs can only be exchanged for money, not a range of goods and services, they are analogous to any other good and not to a currency (Chamberlin 2008). Seyfang (2007) has considered lessons from the operation of complementary currencies (such as LETS) for PCT and found five factors critical for the success of such extra-monetary currencies: policy context; social context and culture; technology and mechanisms; skills and capabilities; and harnessing collective action.

The detailed – and occasionally heated – debates that CRAGgers have engaged in over what is included in their carbon accounts, and what conversion factors are used, suggest that if the government were to introduce a mandatory PCAs scheme, it might need to be prepared to provide information about, and justification for, the conversion factors used in the accounting of such a scheme to those who are interested. A lack of transparency in this respect could possibly lead to opposition, or at least a lack of support, from those who might otherwise be expected to welcome PCAs, if they felt that the conversion factors were incorrect in some way.

For example, if no multiplier were applied to CO₂ emissions from aircraft to take into account the other pollutants that they emit, and the effects of emissions at high altitude, environmentalists might well regard this as a distorted or even dishonest calculation of the impacts. They could argue that the resulting rules about the number of permits required to fly effectively subsidise those who continue to engage in polluting behaviour.

Arguments could also arise about the inclusion or otherwise of green electricity tariffs and journeys by public transport in a national scheme. Many of the CRAGs do not make exceptions for green electricity or public transport use because they consider that to do so results in an inaccurate carbon footprint, and individuals might therefore oppose a national scheme that has different boundaries. However, it seems plausible that in a national scheme environmentalists might accept that green electricity tariffs and public transport journeys should not require the surrender of carbon allowances, at least to begin with, in order to encourage the general public to accept renewables and switch from car use to public transport. The exclusion of green electricity from an allowances scheme, for example, might promote enough consumer demand to encourage more renewable energy generation, whereas at present the action of a few CRAGgers in switching to a renewable energy tariff makes no difference to the overall energy mix of UK electricity supply. There is a strong case to be made for excluding journeys by public transport in the early years of a national scheme, for reasons of simplicity, keeping costs down, and because public transport contributes only a small proportion of most individuals' emissions (Bottrill 2006b).

6.3 Trading

It is interesting to find that so many CRAGgers, whom one might expect to be supporters of personal carbon trading, would actually be unwilling to sell their spare allowances on an open market. If a large proportion of

under-average emitters were unwilling (or failed for other reasons) to trade their spare allowance, this could have serious implications for the effective functioning of the market and therefore of the scheme as a whole. Over-emitters need to be able to buy spare allowances easily, at least in the early years of the scheme, since lifestyle and technological changes will take some time to implement. There is no reason to assume that this unwillingness to sell for moral/environmental reasons will be replicated in the general public, given that it has so far demonstrated less willingness to make personal sacrifices in order to cut emissions. Nevertheless, this finding does suggest a need to explore further people's willingness (and also ability) to trade their PCAs.

The fact that CRAGgers who had to pay a financial penalty found it negligible, even at a carbon price that far exceeds the current market price, suggests that the price of allowances in a national scheme (or transaction costs) would have to be high in order to encourage behavioural change among those unmotivated by environmental concerns, at least those on a reasonably comfortable income.

6.4 Carbon literacy

The increase in carbon literacy that CRAGgers report is a major benefit of the movement. This was largely a result of members having to calculate their own carbon footprint and thereby 'learning by doing' about the relative impacts of different activities. Since a national PCAs system would not require individuals to calculate their own footprint, regular statements (preferably monthly or at least quarterly) will need to be provided to individuals in order to enable them to understand their allowance and hopefully become more carbon literate. The statements should show a breakdown of the different elements that allowances are used for (electricity, gas etc) and the proportion of the quarterly spend and the annual allowance that these represent (see Figure 1 for an illustrative example) in order to encourage awareness of the relative impacts of different activities. Information on the carbon allowances used for each transaction should also be recorded on household energy bills and receipts for purchases of fuels and airline tickets, but a comprehensive statement is required in order that individuals may easily compare 'carbon expenditures'. The statements could also provide 'UK average' figures for each category of expenditure, in order to give a context for the statement, raise awareness of particularly high emissions, and demonstrate to individuals/households with higher emissions that lower emissions are possible.

Roberts and Thumin (2006) consider the implications for PCT of financial literacy research, and Seyfang et al (2007) discuss the need for 'carbon capability' if individuals are to cope with a PCAs scheme. They are developing a carbon trading board game with environmental charity Global Action Plan to develop such capability, and note that the RSA is also doing work in this area.

Figure 1: An illustrative carbon account statement

Rachel A Howell Carbon Allowance Account 00127589439

Statement number: 3

Date: 30/9/2010

Your carbon allowance for 2010: 5000 points

Balance at 1/7/2010: 3000 points

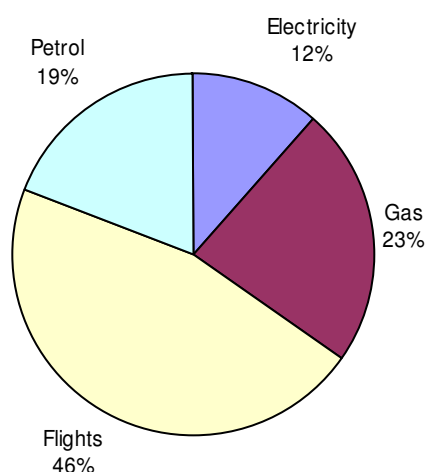
Carbon points used this quarter 1/7/2010 – 30/9/2010

	Points	% of total allowance for the year
Electricity	150	3%
Gas	300	6%
Heating oil	0	0%
Coal	0	0%
Petrol	250	5%
Diesel	0	0%
Airline tickets	600	12%
Total	1300	26%

Balance at 30/9/2010: 1450 points

Your account will be credited with 4800 new points on 1/1/2011

How you used your carbon allowance this quarter:



6.5 Emissions reductions/behavioural change

It is clear from this study that motivated individuals can achieve carbon footprints that are significantly lower than the UK average. The CRAGgers I interviewed reported few absolute barriers to change, although there was mention of the need for government action and grants to make some changes easier (eg. using public transport; installing insulation). However, many of the interviewees were home-owners, which facilitates reduction of emissions from home energy use through installation of insulation, secondary glazing and renewable energy technologies that are unlikely to be considered by those who rent their homes. They were willing to spend time and money to cut their emissions, and to make sacrifices in convenience such as giving up a car (see section 5.7 above). We cannot conclude that the general public would be equally willing or able to accept these costs.

One of the main ways in which CRAGgers had cut their emissions was by reducing or eliminating air travel from their lifestyles. This suggests that it would be important to include air travel tickets within the remit of any national PCAs scheme in order to allow individuals more choice about how to reduce their emissions. Cutting down on flights offers individuals a means to (often significantly) reduce their footprint that is arguably easier than many other behavioural changes (at least in practical terms, once the hard decisions have been made), as well as cheaper if the flight is not replaced by long-distance overland travel. For example, taking a holiday in the UK rather than flying to the Caribbean might involve a once-a-year 'tough decision', whereas commuting to work by public transport rather than using a car necessitates an ongoing commitment. Inclusion of air travel in a PCAs scheme offers those who have few options with regard to cutting other emissions (such as those who live in rented accommodation) more opportunity to manage their carbon allowance.

6.6 The significance of groups

Interviewees reported many positive benefits of being part of a CRAG, but it is not clear that these would be replicated by the introduction of a national PCAs scheme.

Arguably, the sense of 'moral support' might be bolstered by such a scheme, since the entire population would be 'in it together' and people would know that the reductions they made were contributing to UK reductions in a way that would be far beyond what CRAGgers can currently hope to achieve. The personal aspect of this 'moral support' effect would perhaps be provided by an individual's usual contacts (friends and family whom they talk to) rather than an organised group of like-minded individuals who get together specifically to provide support.

An empirical study by Jaeger et al (1993) considered determinants of environmental action with regard to climate change and concluded that exposure to 'rules' about acceptable behaviour, and the existence of social networks in which these rules are considered relevant are more important

determinants of action than knowledge about climate change or socio-demographic factors. Similarly, Bamberg et al (2007) recognise social norms as contributors to the formation of pro-environmental personal norms, not only because they influence people's perception of what is considered 'right' but also their judgements about how 'favourable' and 'easy' certain behavioural options are likely to be. CRAGs are an example of a social network in which attempts to reduce individual/household-level carbon emissions are the norm, and this is part of the 'moral support' that interviewees mentioned as an important benefit of the group. Proponents of PCAs argue that a national scheme would make this a more general social norm. There is, however, a risk of an adverse reaction to a government attempt to create a new social norm, since such norms are not generally imposed from 'above' (Capstick and Lewis 2008).

Another aspect of the 'moral support' offered by CRAGs was the sense of empowerment because participants were taking control of their direct emissions and seeing how they could take action to reduce them. This accords with a proposal that participatory problem-solving must be developed in order to encourage sustainable behaviours, since 'People want to participate, to play a role, in what is going on around them; they hate being incompetent or helpless.' (Kaplan 2000:498) A national PCAs scheme, on the other hand, might be seen as a top-down solution which represents unreasonable government intervention in people's lives rather than allowing personal control (Own et al 2008), although other recent focus group research found that participants associated PCAs with 'empowerment' and 'choice' (Howell 2007).

The other most frequently mentioned benefit of being part of a CRAG was the information sharing aspect. While we might expect a national PCA scheme to be accompanied by information about emissions reductions measures from the government and various other bodies such as energy providers, it was the opportunity to learn from trusted others who had actually tried out particular gadgets or technologies, or who could give local, tailored advice, that was especially valued by CRAGgers. A national PCAs scheme might encourage friends, family and neighbours to provide this kind of support, but again, it would be much more ad hoc than that offered by a CRAG, and therefore perhaps less effective.

It seems unlikely that the sense of accountability to others will be replicated in a national PCAs scheme, since individuals will not need to reveal their carbon footprint. Indeed, it may be that those who have above-average footprints will feel justified by paying for extra allowances, and will see no need to reduce their emissions. Since a PCAs scheme provides an overall cap on national emissions, this will not be a problem in the same way that it would be with carbon taxation. A sense of competition, on the other hand, could be helpfully engendered by a national scheme if individuals were given information on their carbon account statements comparing their own use of carbon allowances with national averages.

One final benefit of CRAGs that just might 'spill over' to a national PCAs scheme is the opportunity for involvement in activities other than personal

emissions reductions. If proponents of PCAs are correct that a scheme would improve carbon literacy, we might expect that some people would get together to work on community-level projects such as installing solar panels on the village hall roof, as they have done through belonging to a CRAG.

7 Conclusions

In conclusion, the experiences of those involved in CRAGs suggest that it is possible for at least a certain section of the population to make significant cuts to their direct carbon emissions, provided that they are motivated. Whether the proponents of PCAs are correct in suggesting that such an allowances scheme would provide motivation for the general population is not possible to determine from this study. These findings do suggest that:

- Equal-per-capita allowances may not be perceived as fair by everyone;
- The issue of what allowance, if any, should be given to children might well be controversial, as might the boundaries of the scheme and the conversion factors used;
- Some under-average emitters will be unwilling on principle to sell their spare allowances on an open market. Widespread unwillingness or inability to trade could have implications for the operation of the system. More research is necessary to explore how people would deal with carbon budgeting and their likely trading behaviour: for example, whether they would be willing to trade allowances, whether people will prefer to immediately sell all their allowance and purchase necessary units at point-of-sale etc;
- The carbon literacy achieved by CRAGgers came about largely because they computed and compared their own footprints; provision of detailed carbon statements to individuals would be necessary to try and encourage a similar effect in a national scheme;
- Some of the benefits of belonging to a CRAG (such as information sharing) would not necessarily apply in a national PCAs scheme; they might occur in a more ad hoc way, but there would still be a place for grassroots support/information groups such as CRAGs.

References

Bamberg, S., Hunecke M. and Blöbaum, A. (2007) 'Social context, personal norms and the use of public transportation: Two field studies' *Journal of Environmental Psychology* **27**: 190-203

Bottrill, C. (2006a) *Understanding DTQs and PCAs*. Background briefing paper for Personal Carbon Trading Workshop, 24 October 2006. Available

online at <http://www.eci.ox.ac.uk/research/energy/downloads/pct/dtq-and-pca.pdf>
[accessed 21/11/08]

Bottrill, C. (2006b) *Personal Carbon Trading: Excluding Public Transportation* UKERC Working Paper. Available online at <http://www.eci.ox.ac.uk/research/energy/downloads/pct/pct-transport.pdf>
[accessed 4/11/08]

Capstick, S. and Lewis, A. (2008) *Personal Carbon Trading: Perspectives from Psychology and Behavioural Economics* Unpublished literature review prepared for IPPR.

Chamberlin, S. (2008) Response to Lynas 2008. See 'comments' on <http://newstatesman.com/environment/2008/01/carbon-cap-lynas-share-price> [accessed 3/10/08]

Dake, K. and Thompson, M. (1999) 'Making ends meet, in the household and on the planet' *GeoJournal* **47**: 417-424

Fawcett, T. (2004) 'Carbon Rationing and Personal Energy Use' *Energy & Environment* **15**(6):1067-1083

Fawcett, T., Bottrill, C., Boardman, B. and Lye, G. (2007) *Trialling personal carbon allowances* UKERC Report No.: UKERC/RR/DR/2007/002. Available online at <http://www.eci.ox.ac.uk/research/energy/downloads/fawcett-pca07.pdf>
[accessed 26/11/08]

Fleming, D. (1996) 'Stopping the Traffic' *Country Life* **140**(19):62-65

Fleming, D. (2005) *Introduction to DTQs* Available online at http://www.dtqs.org/DTQS_overview.htm [accessed 25/11/08]

Fleming, D. (2007) *Energy and the Common Purpose: Descending the Energy Staircase with Tradable Energy Quotas (TEQs)* (2nd edition). London: The Lean Economy Connection

Hillman, M. (1998) 'Carbon budget watchers' *Town and Country Planning* **67**(9):305

Hillman, M. and Fawcett, T. (2004) *How we can save the planet* London: Penguin Books

Howell, R. (2007) *Would Personal Carbon Allowances be acceptable to the UK public as a mean of reducing individuals' carbon dioxide emissions?* Unpublished MSc thesis, University of Edinburgh

Jaeger, C., Durrenberger, G., Kastenholz, H. and Truffer, B. (1993) 'Determinants of Environmental Action with regard to Climatic Change' *Climatic Change* **23**:193-211

- Kaplan, S. (2000) 'Human Nature and Environmentally Responsible Behaviour' *Journal of Social Issues* **56**(3): 491-508
- Lynas, M. (2008) 'If the cap fits, share it' *New Statesman* 31 Jan 2008. Available online at <http://newstatesman.com/environment/2008/01/carbon-cap-lynas-share-price> [accessed 3/10/08]
- Michaelis, L. (2007) 'Consumption behaviour and narratives about the good life' in *Creating a Climate for Change* ed. S. Moiser and L. Dilling. New York: Cambridge University Press
- Monbiot, G. (2006) *Heat* London: Penguin Books
- Monbiot, G. (2008) 'Green Lifeline' *The Guardian* 1st July 2008. Available online at <http://www.monbiot.com/archives/2008/07/01/green-lifeline> [accessed 3/10/08]
- Owen, L., Edgar, L., Prince, S. and Doble, C. (2008) *Personal Carbon Trading: Public Acceptability: A report to the Department for Environment, Food and Rural Affairs* Opinion Leader and Enviros Consulting. London: DEFRA
- Roberts, S., and Thumim, J. (2006) *A Rough Guide to Individual Carbon Trading: The ideas, the issues and the next steps* A report to the Department for Environment, Food and Rural Affairs by the Centre for Sustainable Energy. London: DEFRA
- Ross, A. (2005) *Ideas for a local carbon rationing scheme* Available online at <http://portal.campaigncc.org/node/550> [accessed 25/11/08]
- Ross, A. (2006) *CRAGs: a short guide* Available online at: <http://www.carbonrationing.org.uk/wiki/crags-a-short-guide?> [accessed 4/11/08]
- Seyfang, G. (2007) *Personal Carbon Trading: Lessons from Complementary Currencies* CSERGE Working Paper ECM 07-01. Available online at http://www.uea.ac.uk/env/cserge/pub/wp/ecm/ecm_2007_01.pdf [accessed 25/11/08]
- Seyfang, G., Lorenzoni, I. and Nye, M. (2007) *Personal Carbon Trading: notional concept or workable proposition? Exploring theoretical, ideological and practical underpinnings* CSERGE Working Paper EDM 07-03. Available online at http://www.uea.ac.uk/env/cserge/pub/wp/edm/edm_2007_03.pdf [accessed 25/11/08]
- Starkey, R. (2008) *Allocating emissions rights: Are equal shares, fair shares?* Tyndall Working Paper no. 118. Available online at http://www.tyndall.ac.uk/publications/working_papers/twp118.pdf [accessed 25/11/08]

Tickell, O. (2008) *Kyoto2* London: Zed Books

Acknowledgements

I would like to thank all the CRAG members who so generously gave their time, opinions and hospitality to me during the course of this study, and David Bassendine who answered many emails about the figures for CRAGgers' emissions reductions that are found in section 5.7. I am also grateful to my colleagues Nick Eyre and Yael Parag for their help.

1.1.1 Appendix 1 : CRAG group details

Group	Started accounts	No. Adults	Ration/target (kg)	C price (per kg)	Use of penalty	Includes PT? ⁵	GE discount? ⁶	Kids?	Notes
Oxford	Jan 06	6	1st: 5000 2nd: 4750 Current: ?	4p £100 cap	Carbon reduction projects	Yes	None	Full ration	Group probably dormant now
Hereford	Apr 06	11	1st: 4500 2nd: 4000 Current: 3600	0	N/A	Journeys >30 miles	Zero rated To be reviewed	Full ration	1 st yr average 3.28t.
Stratford	Apr 06	9	Own choice			Yes			No posts/little info on website
Islington	Dec 06	10	1st: 4050 Current: 3645	5p £200 cap	To under emitters	Yes	1 st : 50% now: 5-10%	16 yo full Baby 0?	Settlements every 6 months
Glasgow	Jan 07	13	1st: 4500 Current: 2000	7p 5p	To under emitters	Outside Scotland	10%	Full ration	1 st yr average: 2.6t
Birmingham	Jan 07	c.15	1st: 4500 Current: ?	0	N/A	Long distance			
Surrey Green Party	Jan 07	10	1st: 4000 Current: 4000	10p 10p	Green charities	No	None	<16 no ration	1 st yr: 3 members > ration, most < 3tonnes
Wokingham	Jan 07	14	1st: 4500 Current: ?	2p		Yes			
Langport	Apr 07		8400 group average (baseline -10%)	2p £100 cap	Tbc – Greenpeace /offsetting?				Group average target, not personal but only those over 8.4t will pay if group average is over 8.4t
Leeds	Apr 07	10-20	Own choice	Own choice	Tbc – not under emitters	Yes	50% of proportion that's GE	Full ration	Carbon <i>Reduction</i> Action Group
Redland, Bristol	Apr 07	13	1st: 4500 now: individual	4p £100 cap	Sustainable Redland (charity)	Yes	90%	Full ration	Can do 8 hours/t work for the charity instead of paying 1st yr: all members below target
Sevenoaks	Apr 07	7	Individual, with 5t average	4p £100 cap	Tbc – not under emitters	Long distance + commuting	5%	Full ration	1st yr: 31% average reduction. Targets: 20-15t footprint: 25% annual reduction, 15-10t: 20%, 10-7t: 15%, 7-5t: 10%, 5-0t: 5%

⁵ This column identifies whether the group members include journeys by public transport in their carbon footprint

⁶ GE = 'green electricity' tariffs

Group	Started accounts	No. Adults	Ration/target (kg)	C price (per kg)	Use of penalty	Includes PT? ⁷	GE discount? ⁸	Kids?	Notes
York	Apr 07	30 - not all active?	4500	0	N/A	Yes	None	Full ration	Carbon <i>Reduction</i> Action Group 30 is number on mailing list Group may be fizzling away
Leicester	Sept 07		4500	4p	C reduction projects	Yes	None	< 12 get half	Can retire/save
WSP PACT	Oct 07	54	6000	5p £100 cap	Tbc – C reduction projects?	Journeys > 50 miles	Zero rated	Full ration	Business CRAG. All done by email Under emitters will get reward up to £100 (where from tbc)
Bristol FoE	Dec 07		None	0	N/A				Just monitoring usage and trying to reduce, not rationing
Peckham	Dec 07	3 active	4500	0	N/A	Yes	Some		Other people turn up but only 3 actually measuring
Fownhope	Jan 08	26	Individual baseline - 10%	0	N/A	No	50%	2 get full, more in family: 0	Village Not all 26 are actually counting
Exeter	Apr 08								No info on website, but it is happening
Camden	Apr 08	c.10-12	3650 group target; each has own	5p £100 cap	Tbc – C reduction suggested	Outside greater London	Zero rated	Full ration	Individual targets based on baseline – 10%, but penalty only payable by members over group target
Cornwall	Apr 08	c.10-12	4500	0	N/A			Full ration	
Sheffield area	Apr 08		Individual, converging to 0.5t by 2030	4p no cap	Good causes	>50 miles + commuting, ½ usual factor		Full ration	Volunteer work OK in lieu of payment. Saving allowed, voluntary transfer of allowance between members allowed
Tower Hamlets	Apr 08		6000						Includes food
Alnwick	July 08	8	7400	5p	Green charities	Yes		Full ration	Includes food, monthly calculations

⁷ This column identifies whether the group members include journeys by public transport in their carbon footprint

⁸ GE = ‘green electricity’ tariffs